# Towards High-Precision Navigation and Science Investigations with Deep-Space Optical Transceivers (ADOT)

Completed Technology Project (2015 - 2018)

## Project Introduction

The objective of this task is to study methods and to develop technologies needed to enable navigation and science measurements on the new generation of the Deep Space Laser Communication Transceivers.

The objectives of this task are: (1) To determine the navigational and science requirements for an advanced deep-space optical terminal (DOT 2.0); (2) Based on the current baseline DSOC formulate a set of specific improvements in the architecture that would lead to a compact self-sufficient DOT fully capable of optical comm, navigation, and science measurements; (3) Determine any necessary improvements to the ground-based infrastructure needed to support the navigation and science capabilities of an advanced DOT; 4) Build a proof-of-concept of an advanced DOT capable of ranging and astrometry, and (5) Develop algorithms and models for utilizing ranging and astrometry data for the purposes of high-precision optical navigation and science measurements.

## Anticipated Benefits

Optical systems provide significantly increased data rates or reduced power and a reliable, capable, and cost effective optical communication technology for infusion into operational systems. The technology also provides an on-orbit test bed for both deep space and near earth optical communication mission scenarios.

This task's goals are to ensure that future DOTs are a multi-use system that includes not only-communication, but navigation and science, as well. Doing so would take full advantage of the optical spectrum while maximizing system efficiency for size, weight, and power. Ideally, a fully functional next generation DOT could replace a spacecraft's existing radio system while simultaneously improving its navigation performance and science return.

This technology project will demonstrate & validate a reliable, capable, and cost effective optical communication technology that can be used for commercial space ventures as well as partnerships with other government agencies.

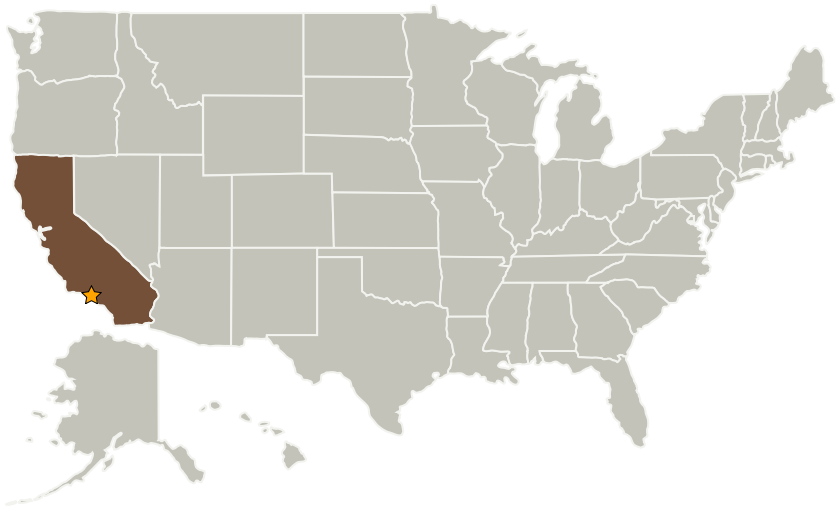
JPL_IRAD_Activities Project

## Table of Contents

# Towards High-Precision Navigation and Science Investigations with Deep-Space Optical Transceivers (ADOT)

Completed Technology Project (2015 - 2018)

## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Jet Propulsion Laboratory(JPL) | Lead Organization | NASA Center | Pasadena, California |

| Primary U.S. Work Locations |
|---|
| California |

## Organizational Responsibility

**Responsible Mission Directorate:**

Mission Support Directorate (MSD)

**Lead Center / Facility:**

Jet Propulsion Laboratory (JPL)

**Responsible Program:**

Center Independent Research & Development: JPL IRAD

## Project Management

**Program Manager:**

Fred Y Hadaegh

**Project Manager:**

Fred Y Hadaegh

**Principal Investigator:**

Slava G Turyshev

**Co-Investigators:**

Inseob Hahn
Michael Y Peng
Michael Shao

# Towards High-Precision Navigation and Science Investigations with Deep-Space Optical Transceivers (ADOT)

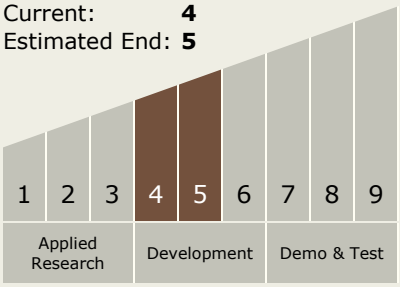
Completed Technology Project (2015 - 2018)

## Images


**JPL_IRAD_Activities Project Image**
JPL_IRAD_Activities Project
*(https://techport.nasa.gov/image/27999)*

## Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **5**




## Technology Areas

**Primary:**

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.6 Optimetrics

## Target Destinations

The Moon, Earth, Others Inside the Solar System

## Supported Mission Type

Push